

21/10

ENTRANCE EXAMINATION FOR ADMISSION, MAY 2010.

M.Sc. (BIOINFORMATICS)

COURSE CODE : 378

Register Number :



Signature of the Invigilator
(with date)

COURSE CODE : 378

Time : 2 Hours

Max : 400 Marks

Instructions to Candidates :

1. Write your Register Number within the box provided on the top of this page and fill in the page 1 of the answer sheet using pen.
2. Do not write your name anywhere in this booklet or answer sheet. Violation of this entails disqualification.
3. Read each question carefully and shade the relevant answer (A) or (B) or (C) or (D) in the relevant box of the ANSWER SHEET using HB pencil.
4. Avoid blind guessing. A wrong answer will fetch you -1 mark and the correct answer will fetch 4 marks.
5. Do not write anything in the question paper. Use the white sheets attached at the end for rough works.
6. Do not open the question paper until the start signal is given.
7. Do not attempt to answer after stop signal is given. Any such attempt will disqualify your candidature.
8. On stop signal, keep the question paper and the answer sheet on your table and wait for the invigilator to collect them.
9. Use of Calculators, Tables, etc. are prohibited.

1. What is the function of DNA polymerase III?
 - (A) It attaches the RNA primers to the DNA strand
 - (B) It adds nucleotide pairs to the growing DNA strand
 - (C) It adds single nucleotides to the growing DNA strand
 - (D) It unwinds the DNA

2. During DNA replication what is the first process of occur?
 - (A) Sealing of the nicks between short DNA sections
 - (B) Synthesis of the lagging strand
 - (C) Unwinding of parental DNA
 - (D) Synthesis of the leading strand

3. Sickle cell anaemia is a disease resultant of missense mutation. What codon number in the DNA sequence does the mutation take place? What amino acid substituted the original glutamic acid? This mutation affects which protein chain in the hemoglobin?

(A) 6; valine; beta hemoglobin	(B) 7; methionine; alpha hemoglobin
(C) 6; cysteine; beta hemoglobin	(D) 7; praline; alpha hemoglobin

4. Why does a single base substitution in DNA base sequence not necessary result in a malfunctional polypeptide?
 - (A) Degeneracy of the triplet code
 - (B) New amino acid is chemically equivalent
 - (C) The substitution takes place at introns
 - (D) All of the above

5. In eukaryotes, transcription of mRNA is (1) catalyzed by what type of enzyme (2) initiated by binding of transcription factors to which important promoter sequence?
 - (A) RNA polymerase IV; TATA box
 - (B) RNA polymerase I; Goldberg-Hogness box
 - (C) RNA polymerase II; TATA box
 - (D) RNA polymerase III ; Goldberg-Hogness box

6. How many domains are there in an immunoglobulin heavy chain constant region?

(A) 2	(B) 3	(C) 6	(D) 5
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7. What is the approximate size (in Mb) of the *Caenorhabditis elegans* genome?
(A) 100 Mb (B) 235 Mb (C) 540 Mb (D) 1000 Mb
8. What reagent is used, in the Edman degradation of a peptide?
(A) Mercaptoethanol (B) Phenylisothiocyanate
(C) Trifluoroacetic acid (D) Trichloroacetic acid
9. What is the origin of the name given to the *Salmonella* genus of bacteria?
(A) It was first isolated from salmon tissues
(B) It is named for microbiologist D. Salmon
(C) It produce pink 'salmon-like' colonies
(D) It smells like salmon fish
10. By what other name is growth hormone known?
(A) Somatomedin (B) Somatotropin
(C) Somatostatin (D) None of the above
11. Which of these disease causing bacteria was discovered by Robert Koch?
(A) *Bacillus anthrax* (B) *Salmonella typhimurium*
(C) *Shigella dysenteriae* (D) *Corynebacterium diphtheriae*
12. Which of the following growth curve is represented by bacterial cultures?
(A) S-shaped (B) V-shaped (C) J-shaped (D) L-shaped
13. Phosphofructokinase I is inhibited only by
(A) ATP only (B) ATP and citrate both
(C) Hexokinase (D) Isocitrate dehydrogenase
14. Nicks in a double-stranded DNA molecule can be repaired by
(A) DNA topoisomerase (B) DNA polymerase I
(C) DNA ligases (D) Polynucleotide kinase

15. At which wavelength are DNA/RNA concentrations measured?
(A) 240 nm (B) 260 nm (C) 300 nm (D) 340 nm
16. In each round of fatty acid oxidation
(A) NADH and ATP is released
(B) NADH₂ and ATP is released
(C) NADH₂, FADH₂ and Acetyl CoA is released
(D) FADH₂ and Acetyl CoA is released
17. Which of the following pairs of compounds are interconvertible in the liver by a single polypeptide chain containing two different catalytic sites?
(A) Glucose and, glucose 6-phosphate
(B) 3-Phosphoglycerate and phosphoenol pyruvate
(C) Fructose 6-phosphate and fructose 1,6-bisphosphate
(D) Fructose 6-phosphate and fructose 2,6-bisphosphate
18. Which of the following occurs as a result of epinephrine binding to its receptor?
(A) cAMP is produced from AMP
(B) Phosphorylase kinase is phosphorylated and glycogen synthase is dephosphorylated
(C) Phosphodiesterase is activated to prolong the effect of cAMP
(D) A phosphatase inhibitor is activated by phosphorylation
19. When the coding region of a prokaryotic gene is cloned into the *lac Z* gene downstream from the translational initiator, the chance of an in-frame fusion is
(A) 1/6 (B) 1/5 (C) 1/3 (D) 1/2
20. Which of the following elements is LEAST likely to be found on any + strand viral genomic RNA?
(A) A cap
(B) A binding site for RNA-dependent RNA polymerase
(C) A binding site for ribosomes
(D) A binding site for RNA polymerase II

21. A gas performs the most work when it expands
(A) isothermally (B) adiabatically
(C) at a non-uniform rate (D) isobarically
22. A thermos flask contains hot tea. It is vigorously shaken. If the tea is considered as the system, then its temperature will
(A) not change (B) rise
(C) fall (D) first fall and then rise
23. The door of an operating refrigerator is opened. Now the temperature of the room will
(A) increase
(B) decrease
(C) remain unchanged
(D) decrease in summer and increase in winter
24. In the case of a petrol engine, the real useful work is done in the
(A) exhaust stroke (B) suction stroke
(C) compression stroke (D) explosion stroke
25. Heating of water under atmospheric pressure is an
(A) isothermal process (B) isobaric process
(C) adiabatic process (D) isochoric process
26. The function of the carburetor in a car engine is to
(A) filter the petrol before entering the piston chamber
(B) form a proper mixture of air and petrol
(C) maintain a proper flow of petrol in the engine
(D) check air from going into engine
27. Metals are good conductors of heat because
(A) they contain free electrons (B) they are relatively far apart
(C) their atoms collide very frequently (D) they have a reflecting surface
28. Heat is transmitted from higher to lower temperature through molecular collisions in
(A) viscosity (B) radiation (C) convection (D) conduction

29. A pendulum suspended from the ceiling of a train has a period T when the train is at rest. When the train is accelerating with a uniform acceleration at the period of oscillation will
- (A) increase (B) decrease
(C) remain unaffected (D) become infinite
30. A hollow metallic sphere is filled with water and hung by a long thread. A small hole is drilled at the bottom through which water slowly flows out. Now the sphere is made to oscillate. The period of oscillation of sphere
- (A) decreases (B) increases
(C) remains constant (D) first increases and then decreases
31. Wavelength of any radiations from electromagnetic spectrum is
- (A) Directly proportional to its frequency
(B) Inversely proportional to its frequency
(C) Inversely proportional to its velocity
(D) None of the above
32. A pair of electric charges of equal magnitude but opposite sign, separated by some, usually small, distance
- (A) Insulator (B) Magnetic dipole
(C) Electric dipole (D) None of the above
33. A 2-kg object is moving horizontally with speed of 4 m/s. How much net force is required to keep the object moving at this speed and in this direction
- (A) 8 N (B) 0 N
(C) 50 N (D) None of the above
34. Imagine a place in the *cosmos* far from all gravitational and frictional influences. Suppose that you visit that place (just suppose) and throw a rock. The rock will
- (A) Gradually stop
(B) Continue in motion in the same direction at constant speed
(C) Continue in motion in the same direction at different speed
(D) None of the above
35. An airplane accelerates down a runway at 3.20 m/s^2 for 32.8 s until it finally lifts off the ground. Determine the distance traveled before takeoff
- (A) $d = 1720 \text{ m}$ (B) $d = 0 \text{ m}$ (C) $d = 10 \text{ m}$ (D) $d = 17.2 \text{ m}$

36. A certain number (call it "one zillion") of oxygen atoms weighs 1.200 g. What will be the weight of an equal number of lithium atoms?
- (A) 0.570 g (B) 1 g (C) 2 g (D) 5.7 g
37. How many kilograms of metallic magnesium could theoretically be obtained by decomposing 0.400 kg of magnesium oxide into its elements
- (A) 0.241 kg of Mg (B) 0.5 kg of Mg
(C) 0.7 kg of Mg (D) 0.9 kg of Mg
38. Suppose that we have N carbon atoms, where N is a number large enough to give us a pile of carbon atoms whose mass is 12.0 grams. How much would the same number, N , of oxygen atoms weigh?
- (A) 16.0 g (B) 20.0 g
(C) 25.0 g (D) None of the above
39. Methanol, CH_3OH , is a liquid having a density of 0.79 g per millilitre. Calculate the molar volume of methanol
- (A) $V_M = 0.0405 \text{ L mol}^{-1}$ (B) $V_M = 0.100 \text{ L mol}^{-1}$
(C) $V_M = 0.1050 \text{ L mol}^{-1}$ (D) $V_M = 0.0025 \text{ L mol}^{-1}$
40. How many grams of KCl will contain 10 g of potassium?
- (A) 20 g (B) 19 g (C) 50 g (D) 30 g
41. Ubiquitin is a protein of about
- (A) 46 amino acids (B) 56 amino acids
(C) 66 amino acids (D) 76 amino acids
42. The oxygen carrier protein in muscles is
- (A) Myoglobin (B) Hemoglobin
(C) Immunoglobulin (D) Methemoglobin
43. One CentiMorgan is
- (A) Recombination ratio of 1% over small distances in a chromosome
(B) Recombination fraction of 1% over small distances in a chromosome
(C) Recombination indexes of 1% over small distances in a chromosome
(D) Recombination rate of 1% over small distances in a chromosome

44. Individuals must be _____ in order to be informative for linkage analysis.
- (A) Double heterozygotes (B) Double homozygotes
(C) Single heterozygotes (D) Single homozygotes
45. _____ is the presence and absence of either allele could be recognized in any individual, regardless of pedigree information.
- (A) Dominant allele (B) Recessive allele
(C) Codominant allele (D) Corecessive allele
46. What is PIC in terms of genomics
- (A) Polymorphism information Content (B) Protein information content
(C) Polymerase information content (D) Primers information content
47. Haplotypes are also said to be
- (A) Linkage map (B) Linkage study
(C) Linkage ratio (D) Linkage phase
48. HAT medium was first applied to hybrid cells by
- (A) Littlefield in 1964 (B) Donahue in 1968
(C) Ruddle in 1975 (D) Deisseroth in 1977
49. What is FACS?
- (A) Fluroescence activated cell sorter
(B) Fluroescence adhered cell sorter
(C) Flow activated cell sorter
(D) Flow adherence cell sorter
50. Which of the following is an autosomal recessive disorder?
- (A) Duchenne Muscular Dystrophy
(B) Cystic Fibrosis
(C) Chronic Granulomatous Diseases
(D) Hemophilia

51. Tumor cells may have surface antigens to which the immune system is not tolerant. Nevertheless, well established tumors are usually resistant to killing by CTL. This may occur via mutational loss of plasma-membrane proteins. Loss of which protein should be most effective in reducing killing by CTL?
- (A) IL-2 receptor (B) TNF receptor
(C) Fc receptor for IgG (D) Class I MHC
52. An Rh-negative mother has given birth to an Rh-positive child. In this situation you need to determine the extent of the mother's immune response to Rh antigen. Which test should you order? [Antiglobulin test = Coombs' test]
- (A) Indirect antiglobulin test on serum from the newborn and Rh+ erythrocytes
(B) Indirect antiglobulin test on maternal serum and Rh+ erythrocytes
(C) Indirect antiglobulin test on maternal serum and Rh- erythrocytes
(D) Direct antiglobulin test on maternal erythrocytes
53. An organized collection of logically related data is known as
- (A) Data (B) Metadata
(C) Database (D) Data versus information
54. Size of a database are usually measured in terms of
- (A) Tera Bytes (B) Mega Bytes (C) Giga Bytes (D) Data Bytes
55. The data, administration subsystem helps you perform all of the following, except
- (A) Backups and recovery
(B) Query optimization
(C) Security Management
(D) Create, Change and Delete information
56. The network which have a single communication channel that is shared by all the machines on the network is
- (A) Point-to-point Network (B) Personal Area Network
(C) Broadcast Network (D) Virtual Network
57. Computers that connect three or more transmission lines are
- (A) Transmission lines (B) Switching elements
(C) Hosts (D) Subnet

58. The situation when too many packets are present in the subnet is called
 (A) Overlapping (B) Flooding
 (C) ALOHA (D) Congestion
59. The parts of the network is called
 (A) Intranet (B) Subnet (C) Supernetwork (D) Subnetwork
60. The network security software is a
 (A) Netwall (B) Firewall (C) Secuiry wall (D) VPN
61. The conversion of pyruvate to oxaloacetate is likely to require which of the following coenzymes?
 (A) Biotin (B) Vitamin B12
 (C) Thiamine pyrophosphate (D) Pyridoxal phosphate
62. Which of the following hormones initiates biological actions by crossing the plasma membrane and then binding to a receptor?
 (A) Glucagon (B) Estradiol
 (C) Insulin (D) Norepinephrine
63. An enzyme that catalyzes the reaction $A \leftrightarrow B$ changes the
 (A) Equilibrium constant
 (B) Equilibrium concentration of A
 (C) Entropy of the reaction
 (D) Rate of both the forward and reverse reaction
64. Cells with abundant apical microvilli are characteristically found in
 (A) Exocrine gland
 (B) The reticuloendothelial system
 (C) Neuronal dendrites
 (D) Absorptive epithelia
65. Diacylglycerol activates which of the following enzyme?
 (A) Protein kinase A (B) Protein kinase C
 (C) MAP kinase (D) Phosphorylase b kinase

66. Cellular proteins destined for secretion are sorted and packaged in the
(A) Endosomes (B) Endoplasmic reticulum
(C) *Trans* Golgi network (D) Peroxisomes
67. Incubation of gram-negative bacteria with lysozyme in an isotonic medium causes rod-shaped bacteria to assume a spherical shape. This phenomenon is
(A) Destruction of cell wall (B) Destruction of cytoskeleton
(C) Damage to the cell membrane (D) Change in gene expression
68. Virus-mediated transfer of cellular genetic material from one bacterial cell to another by means of virus particles is called
(A) Transfection (B) Transformation
(C) Transposition (D) Transduction
69. Which of the following processes leads to the formation of polytenc chromosomes?
(A) Nondisjunction of chromatids during meiosis
(B) Recombination between adjacent chromosome segments
(C) Sister chromatid exchange
(D) Repeated replication without separation of chromatids
70. In the classical model of transcriptional control described by Jacob and Monod, a repressor protein binds to
(A) An Enhancer (B) An AUG sequence
(C) An Operator (D) A TATA box
71. Satellite DNA consists of
(A) Extra chromosomal DNA
(B) Short repetitive nucleotide sequences
(C) Ribosomal RNA genes
(D) Single gene regions
72. Genes containing introns are called
(A) silent genes (B) split genes
(C) structural genes (D) pseudogenes
73. NOR (nucleolus organizing region) occurs in the region of
(A) secondary constriction (B) primary construction
(C) telomere (D) centromere

74. Approximately what percentage of human genome contain protein coding genes
 (A) ~2% (B) ~20% (C) ~50% (D) ~80%
75. Pribnow box located at
 (A) +10 position (B) -10 position
 (C) +35 position (D) -35 position
76. The first bioinformatics database was created by
 (A) Richard Durbin (B) Margaret Dayhoff
 (C) Michael j. Dunn (D) Pearson
77. SWISSPROT protein sequence database began in
 (A) 1985 (B) 1986 (C) 1987 (D) 1988
78. An example of Homology & similarity tool?
 (A) PROSPECT (B) EMBOSS
 (C) RASMOL (D) BLAST
79. Deposition of cDNA into inert structure is
 (A) DNA finingerprinting (B) DNA polymerase
 (C) DNA probes (D) DNA microarrays
80. Humam genome contains about
 (A) 2 billion base pairs (B) 3 billion base pairs
 (C) 4 billion base pairs (D) 5 billion base pairs
81. The identification of drugs through genomic study
 (A) Genomics (B) Cheminformatics
 (C) Pharmacogenomics (D) Phrmacogenetics
82. Analysing or comparing entire genome of species
 (A) Bioinformatics (B) Genomics
 (C) Proteornics (D) Pharmacogenomics
83. Characterizing molecular component is
 (A) Genomics (B) Cheminformatics
 (C) Proteomics (D) Bioinformatics

84. When you save a file, it means that you have
(A) E-mailed it (B) Placed it in RAM
(C) Written it to a disk (D) Rescued it from oblivion
85. To maintain computer files in an orderly fashion means to organize them
(A) Hierarchically (B) Randomly
(C) Linearly (D) Orthogonally
86. In ATP synthase, F_0 act as
(A) H^+ carrier (B) Cl^- carrier
(C) Electron carrier (D) None
87. Protein crystallography has no _____, only small molecules have them.
(A) Mirror Symmetry (B) Symmetry fold
(C) Screw axis (D) Screw fold
88. The shape of the plot of intensity versus scattering angle for the diffraction pattern of an isolated object is called the
(A) Path (B) Interference (C) Envelop (D) Lattice
89. The combination of reflection across a plane with a translation is said to be
(A) Group plane (B) Glide plane (C) Mirror plane (D) Phase plane
90. A(n) _____ is a solid with a regular arrangement of atoms in its internal structure.
(A) Atom (B) Molecule (C) Crystal (D) Unit cell
91. Threading
(A) Protein structure prediction (B) Genome annotation
(C) Sequence alignment (D) Sequence analysis
92. The presence of a set of homologous genes in the same order on two different genomes.
(A) Codon usage (B) Synteny
(C) Karyotype (D) None of the above

93. Stringency-refers to
(A) Minimum number of matches required within a window for Filtering
(B) Maximum number of matches required within a window for Filtering
(C) Both (A) and (B)
(D) None of the above
94. Uses dynamic programming to find local alignments between sequences
(A) Smith-Waterman algorithm (B) Needleman and Wunsch algorithm
(C) Both (A) and (B) (D) None of the above
95. The entire collection of proteins that are encoded by the genome of an organism
(A) Proteome (B) Proteomics
(C) Both (A) and (B) (D) None of the above
96. A hidden Markov model of a conserved region in a multiple sequence alignment
(A) Profile hidden Markov model (B) Block hidden Markov model
(C) Pattern hidden Markov model (D) Domain hidden Markov model
97. Represents the variation found in the columns of an alignment of a set of related Sequences
(A) Position-specific scoring matrix (B) Block substitution matrix
(C) Point accepted mutation matrix (D) Mutation data matrix
98. The percentage of the columns in an alignment of two sequences that includes same amino acids
(A) Percent similarity (B) Percent identity
(C) Percent match (D) Percent homologous
99. Genes that are related through gene duplication events
(A) Paralogs (B) Homologs
(C) Orthologs (D) All of the above
100. Matrices describe the probability that one base or amino acid has changed during the course of evolution
(A) Position-specific scoring matrix (B) Block substitution matrix
(C) Point accepted mutation matrix (D) Mutation data matrix